Meyers, Charles

From: Swanson, Greg
Sent: Thursday, August 22, 2002 2:06 PM
To: Meyers, Charles
Cc: Finnegan, Charles; Oliver, Stan; Aggarwal, Pravin
Subject: RE: SRB APU fuel pump inlet port crack - technical issue review

It should also be noted that redundant sealing is not verified before flight, all we know from a leak check is that at least one of the seals (metal to metal or o-ring) is functioning. In the worst case a fitting could be cracked past the metal-to-metal seal, pass the leak checks based on the o-ring seal, and subsequently have the o-ring fail or the crack grow in flight.

If the crack was pre-existing in the inlet port before installation of the rosan fitting the assembly preload is high enough to significantly grow the crack, and similar to the one cracked inlet port which failed during rosan re-installation, both seals would likely be breached. If this part somehow made it to assembly into a flight system it would likely fail leak checks.

However, the cracked unit would have passed leak checks with the original crack. The rosan fitting removal and re-installation during refurbishment failed the part and the crack was found. The part in question possibly flew with a crack very close to breaching the metal-to-metal seal, there is no way to determine in which flight (or phase of flight) the crack occurred. So it is possible that a pump inlet port can be cracked, possibly even past the metal-to-metal seal, and pass the current screens for flight. In such a case the only remaining protection against leakage is the small amount of crack growth predicted by analysis.

Another point, the current units for the next 3 flights are a mixed bag. The number of flights since rosan installation and the type of grease used vary.

The flight rational boils down to this:
1. The units passed leak checks after test firing. Therefore, at least one inlet port seal is functioning. If cracked both seals were not compromised.
2. If the fuel pump does have an inlet port crack the growth rate at that location (determined by analysis) is expected to be very low so seal integrity should be maintained.

Visual inspection for cracks/corrosion (a qualitative inspection at best, no CIF size or POD) and successful flight history fill out the charts on rationale. These should not be given too much weight, if the first two points make you nervous you shouldn't rely on visual inspection and history for comfort. Remember, the cracked unit may have flown with a crack after visual inspection.

-----Original Message-----
From: Meyers, Charles
Sent: Thursday, August 22, 2002 12:55 PM
To: Swanson, Greg
Subject: RE: SRB APU fuel pump inlet port crack - technical issue review

This rationale applies to the fuel pump inlet port only. It was mentioned that this investigation could expand to other fittings. I think this specific issue will go forward to the more general FRR.

-----Original Message-----
From: Swanson, Greg
Sent: Thursday, August 22, 2002 12:27 PM
To: Meyers, Charles; Finnegan, Charles; Oliver, Stan; Aggarwal, Pravin
Subject: RE: SRB APU fuel pump inlet port crack - technical issue review

Was there any discussion about other areas of the fuel pump, or other components in the system?

-----Original Message-----
From: Meyers, Charles
Sent: Thursday, August 22, 2002 11:14 AM
To: Finnegan, Charles; Oliver, Stan; Aggarwal, Pravin; Swanson, Greg
Subject: SRB APU fuel pump inlet port crack - technical issue review

I attended a technical issue review for the SRB APU fuel pump inlet port crack issue. Just wanted to pass on

USA's rationale for flight that they presented. I have not worked this issue, but am passing this on to those that did.

Rationale for flight, STS-112/BI115

- cracked fuel pump housing will be screened prior to flight
  - Sundstrand hotfire
  - GHe leak test
  - ACO hotfire with subsequent sniff checks

- minimal risk of crack growth during flight
  - small flight loads do not grow crack
  - water impact not considered

- redundant seal
  - metal-to-metal seal primary
  - o-ring is secondary

- inspection of 48 pumps in inventory shows no corrosion

- this occurrance of corrosion is believed to be unique due to inadequate corrosion inhibitor

Comment from USA presentor did indicate that this is not the most robust design. Yielding of housing under normal installation conditions is not good design, but change to Krytox grease reduces preload such that yielding does not occur.

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